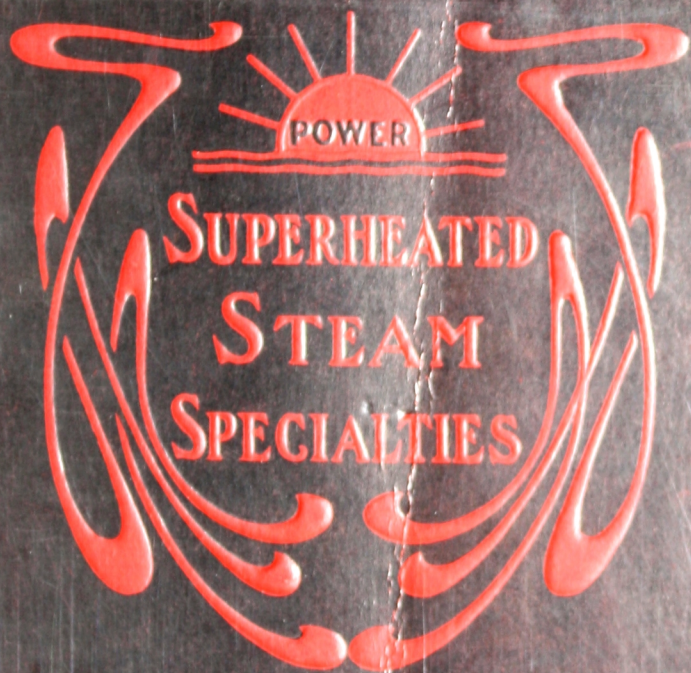


458-11

FOSTER SUPERHEATERS



POWER SPECIALTY COMPANY
111 BROADWAY
NEW YORK

PHILADELPHIA OFFICE, LAND TITLE BUILDING

FOSTER SUPERHEATERS



POWER SPECIALTY COMPANY
111 BROADWAY
NEW YORK

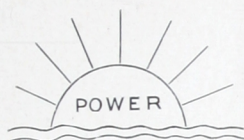
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SUPERHEATED STEAM

Fourth Edition



THE FOSTER PATENT SUPERHEATER

Patented Nov. 17, 1903

Manufactured by
POWER SPECIALTY COMPANY

BRANCH OFFICES

BOSTON, *10 Post Office Square.*
CHICAGO, *The Rookery.*
PHILADELPHIA, *Land Title Building.*
ST. LOUIS, *Chemical Building.*

AGENCIES

MILWAUKEE, *1015 Railway Exchange.*
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Works: Dansville, N. Y.

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1907

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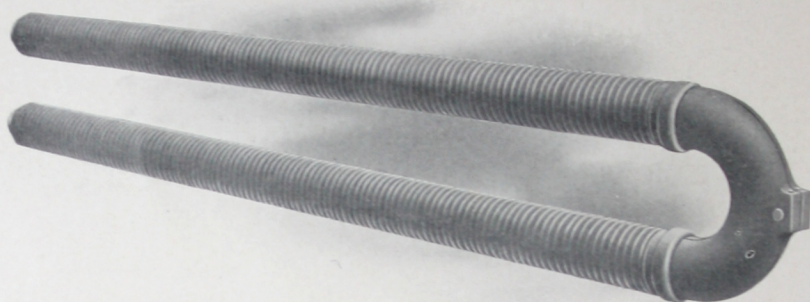


The Foster Patent Superheater

Those features of the Foster Superheater which distinguish the construction from all other types are chiefly the result of actual experience in designing and building superheaters. They are also checked by careful research into the various designs and records of performance of superheaters for the past fifty years.

DESIGN.—A study of the defects of past forms of superheaters will indicate the most important points to be covered in good design. The superheater must be as free as possible from liability to burn out in case of a chance overheating of the exposed surfaces. The circulation must be properly distributed throughout the superheater at full load as well as at partial loads. The various parts must be accessible for inspection, both externally and internally, and must be readily renewable or easily repaired. There must be provision for free expansion and contraction of the various parts. The supporting arrangement must be carefully worked out. All these features are realized in the Foster Superheater.

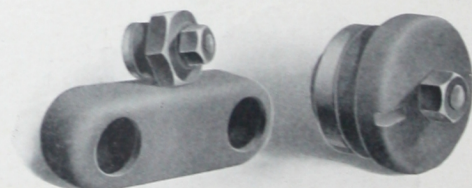
MATERIAL.—Of prime importance is the material with which a superheater is made. Cast iron has given excellent results in producing durable superheaters and has been extensively used because of its ability to withstand high temperatures. For high steam pressures, however, cast iron is not considered safe, and has given way to the use of Seamless Steel Tubes. These are homogeneous and strong, but lack the heat resisting qualities of cast iron. It is evident that a combination of these two metals will preserve the good qualities of both.



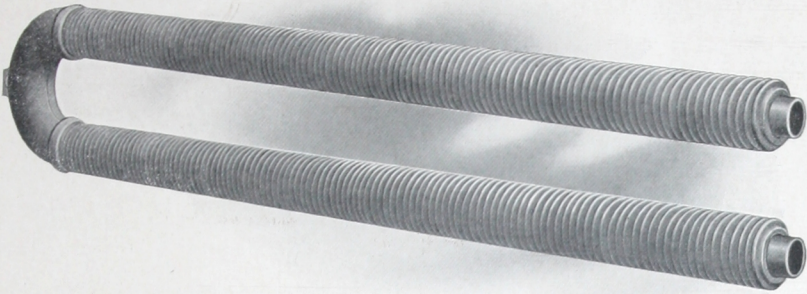
Return element used in construction of Foster Superheater showing the protection for the tube throughout, including the bend.



Steel return header; special hand hole plug and cap used in construction of Foster Superheaters.

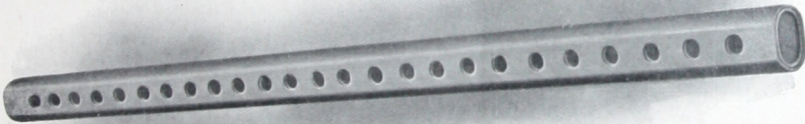


2" Steel return header; 2" and 4" special hand hole plugs complete used in construction of Foster Superheaters.



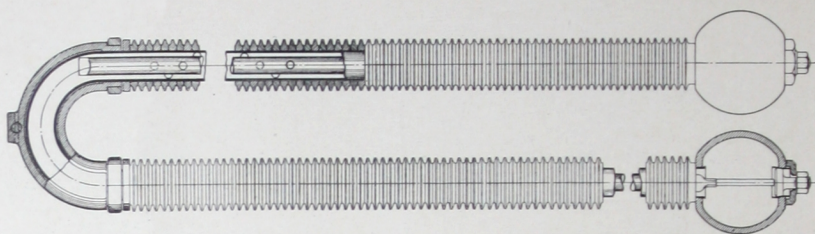
Return element used in construction of the Foster Superheater showing the ends which are attached to the headers.

CONSTRUCTION.—This is precisely what is done in the Foster Superheater, which it will be observed from the illustrations, consists of a series of straight elements or tubes which are generally placed parallel to each other. The elements are joined at one end to manifolds or connecting headers, and at the other end to return headers, for which return bends



Wrought steel connecting header used in construction of Foster Superheaters.

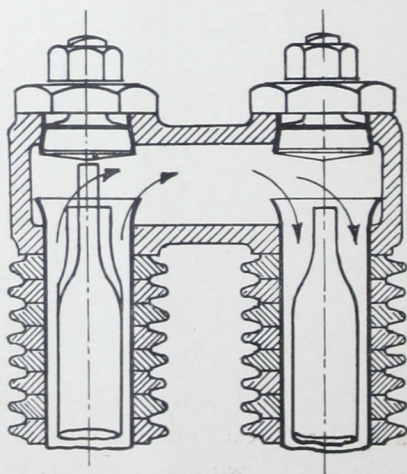
are often substituted. The elements consist of straight seamless drawn steel tubes, on the outside of which are fitted a series of cast iron annular gills or flanges, placed close to each other and carefully fitted to the tube so as to be practically integral with it, at the same time exposing an external surface of cast iron, which metal is best adapted to resist the action



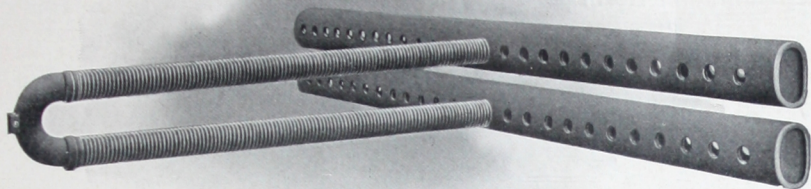
Cross sectional view of return bend element and connecting headers used in the construction of Foster Superheaters.

of the heated gases. The rings or annular gills are carefully bored to gauge and shrunk on the tubes. Once being in position the rings and tubes act practically as a unit. As the co-efficient of expansion of steel is a trifle greater than that of cast iron, the rings grip the tubes even tighter when in service.

STRENGTH.—This form of construction is flexible and durable. It provides a section of great ultimate strength and entire freedom from internal strains. The mass of metal in the tubes and covering acts as a reservoir for heat, which is imparted to the steam evenly, tending to secure a constant temperature of steam in spite of fluctuations in the temperature of the hot gases. The seamless drawn tube secures great initial strength which is reinforced by the rings shrunk on the outside.



Cross section used showing method of attaching return headers to elements of Foster Superheaters.



One protected return element of Foster Superheater, showing inlet and outlet headers.

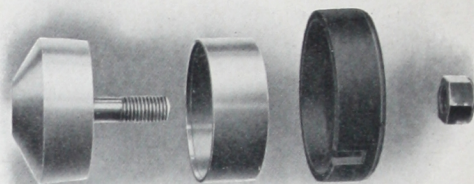
INNER TUBES.—Inside of the elements there are placed other tubes of wrought iron, which are centrally supported by means of knobs or buttons regularly spaced throughout their length. These inner tubes are closed at the ends. A thin annular passage for the steam is thus formed between the inner and outer tubes. The steam clinging closely to the heating surface is quickly heated in the most efficient manner.

JOINTS.—The joints at the end of the elements are made by expanding the steel tube into headers which are of wrought steel, except in special cases where cast steel is preferable.

FLOODING.—There are times when in the ordinary use of a superheater the circulation of steam will be less than at others, while at such times the superheater may be exposed to furnace gases at a high temperature. Such a condition takes place when the load is temporarily arrested or when getting up steam in boilers. Others have guarded against damage to the superheater under these conditions by providing a flooding arrangement, by which the superheater tubes are filled with water and made part of the evaporating surface of the boilers. To do this it is necessary to open and close certain valves on each boiler, which operation must be reversed when the critical period is over and the superheaters are to resume their normal function.

To admit water to the interior of the superheater invites the formation of scale in the tubes, which would result in a loss of efficiency or stoppage of circulation. A superheater which has been flooded must be drained before putting back in service. This necessitates on each boiler

a double operation on the part of the attendant, which must be done with great care and intelligence because of the disastrous results to the engine which would be likely to follow if the water in the superheater were driven into the steam pipes.

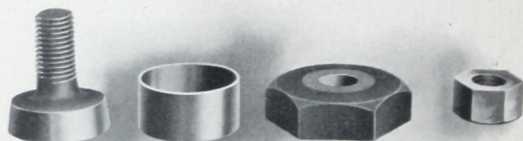


4" Hand hole plug, gasket, cap and nut used in construction of Foster Superheaters.

The Foster Superheater is designed with a view to avoiding the necessity for flooding devices or any form of connection between the water space of the boiler and the superheater.

The protection afforded by the external covering of cast iron is ample to prevent damage to the surface during the process of steam raising.

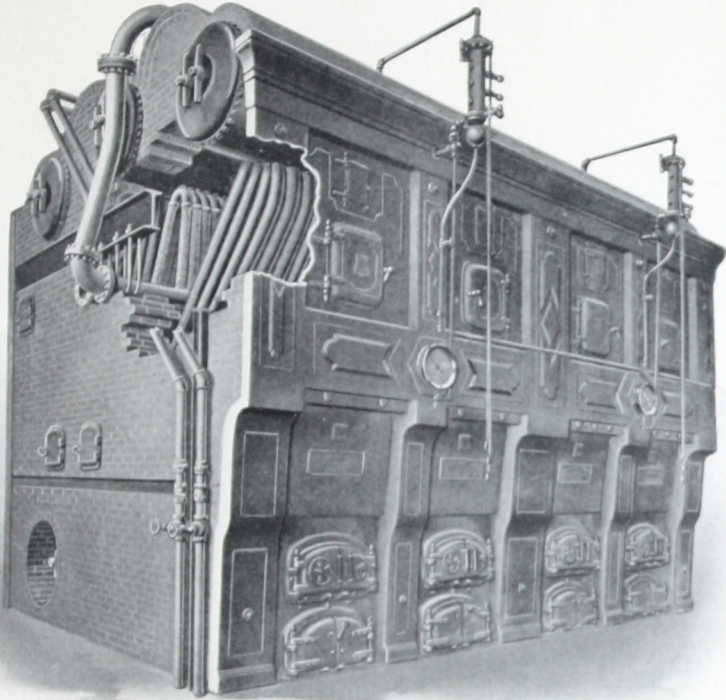
The Foster Superheater is fool proof.



2" Hand hole plug, gasket, cap and nut used in construction of Foster Superheaters.

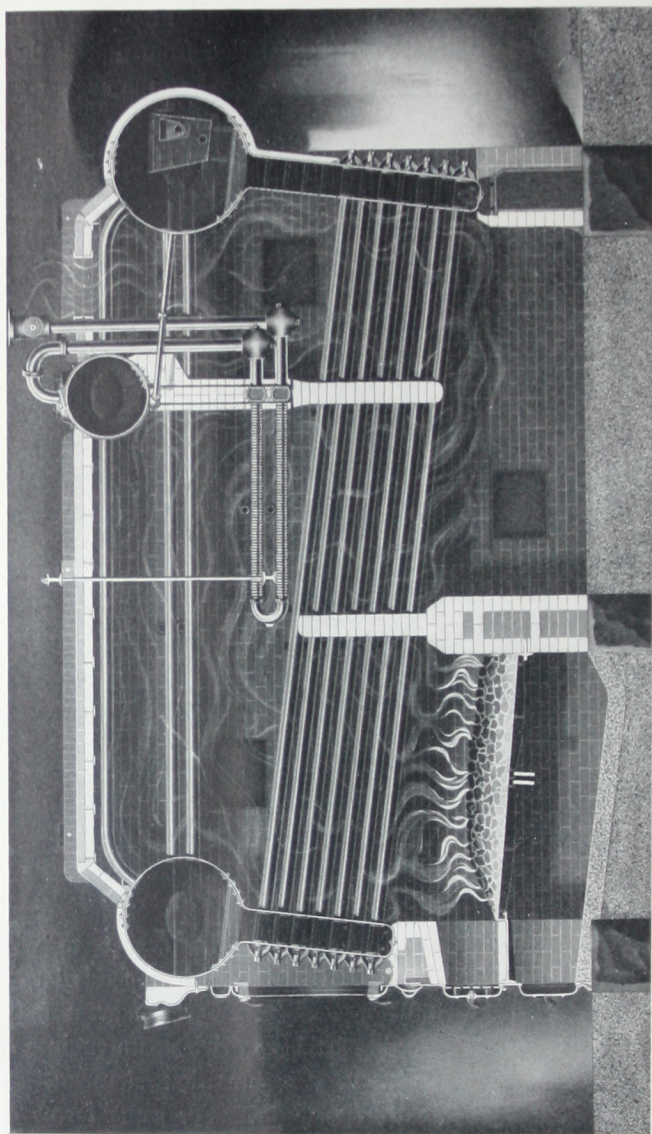
PROPORTIONS.—In proportioning a superheater for any special size and type of boiler, it is only necessary to determine the quantity of steam to be superheated and the amount of superheat desired; this, in connection with the temperature of the furnace gases where they will strike the superheater will determine the amount of surface required and the cross-sectional area to allow for the passage of the steam. It will be readily seen that by our form of construction great flexibility of design is permissible. By providing a sufficient number of elements for the steam to go through in parallel, the drop in pressure in passing through the superheater may be reduced to any desired point, or eliminated entirely.

COUNTER CURRENTS.—Advantage may be taken of all the heat available in the gases by arranging the elements in such a manner that the steam will pass in counter-current direction from that of the furnace gases, so that the coolest steam will be exposed to the coolest gases and vice versa.

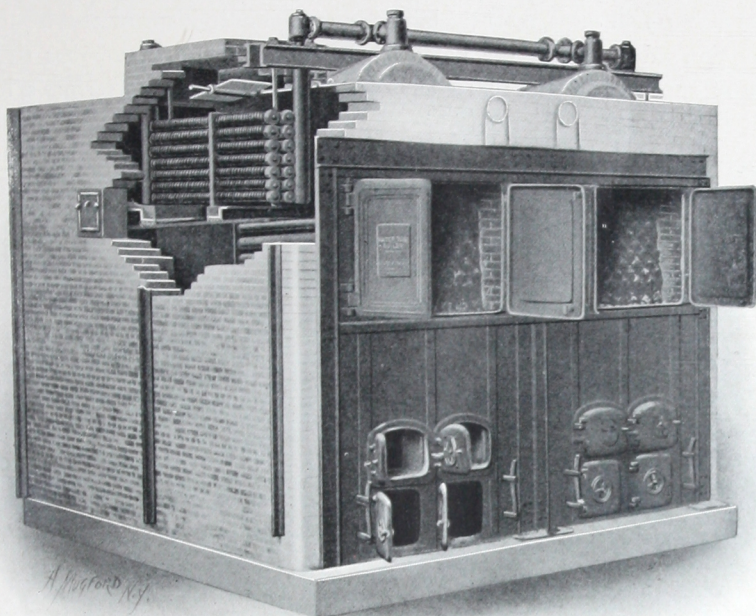


Foster Superheater combined with Sterling Water Tube Boiler.

AMOUNT OF SUPERHEAT DESIRABLE.—The degree to which the steam should be superheated is a question which depends largely upon the conditions governing individual cases. For the great majority of conditions, however, where the service is to drive steam engines or steam turbines, we recommend as a result of a somewhat extended experience, a temperature of about 500 degrees Fahr. For some forms of steam turbines and engines a temperature of 600 or 650 degrees Fahr. is preferable, and oftentimes for industrial purposes it is necessary to have a temperature of 900 to 1,000 degrees Fahr. We have built superheaters which are now in successful operation for all of these different conditions.



Foster Superheater combined with Atlas Water Tube Boiler.



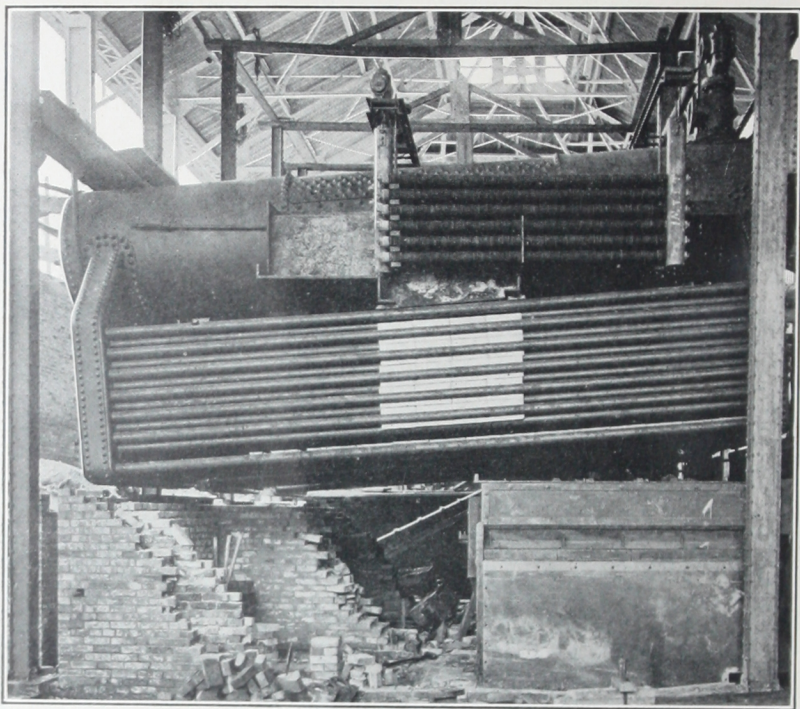
Foster Superheater combined with Franklin Water Tube Boiler. A damper controls the amount of superheat.

SUPERHEATED STEAM.

Water when heated sufficiently turns into saturated steam. Saturated steam when further heated becomes superheated steam. Steam is generated from water in a boiler but must be separated from the water before it can be superheated, hence a superheater is necessary. To utilize the heat from one furnace for both steam making and steam superheating, the boiler and superheater are often combined in the same furnace. At times it is found more convenient to fit both boiler and superheater each with its own furnace. The choice between these two methods must be governed by the space available, arrangement of pipe connections and requirements of the service, conditions which will vary with each installation.

Superheating may be described as the final step in the preparation of steam for most efficient use in driving engines of whatever type, or supplying heat for drying rooms, or for various chemical or industrial processes.

The advantages of superheating have been recognized for over fifty years, but not until recently has steam engine and steam turbine construction advanced to the point where there are no drawbacks to the use of superheat. European engineers and particularly Germans have



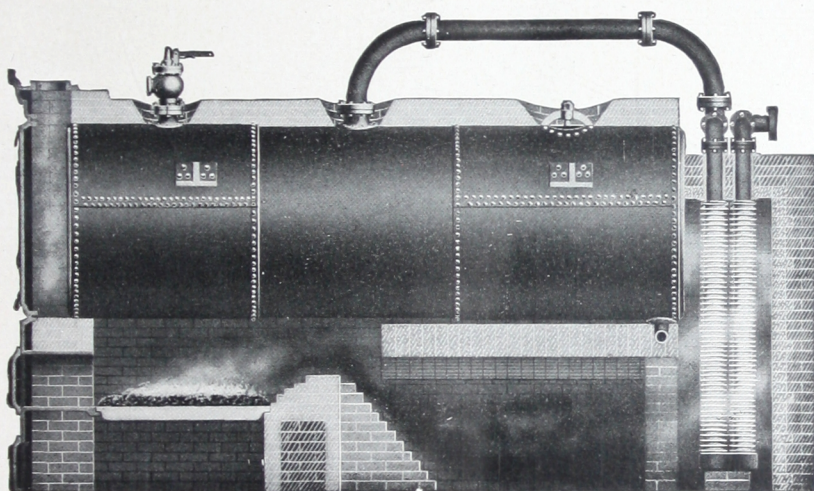
Foster Superheater Combined with Heine Boiler in course of erection

done much to advance the art, but that Americans are fully awakened to the importance of the subject is proved by the fact that while four or five years ago the superheater installations in this country were rare, a fair estimate of superheaters now in use or under construction would be considerably over a million horse-power upon the basis of thirty pounds of steam hourly per horse-power.

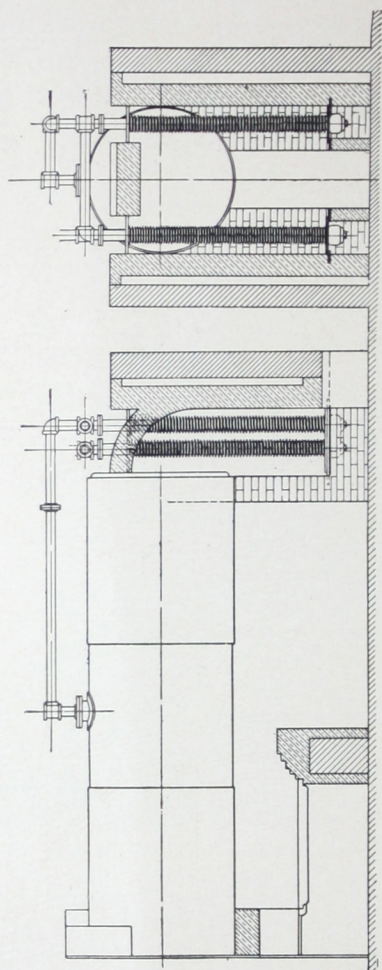
The early limitations to superheated steam were largely due to the want of mineral oils for lubrication and metallic packing for joints and stuffing boxes, all of which are now incidental to good practice.

The fact that the temperature of superheated steam is not dependent upon the pressure, makes it possible to obtain a high temperature at a low pressure, and adds immeasurably to the element of safety.

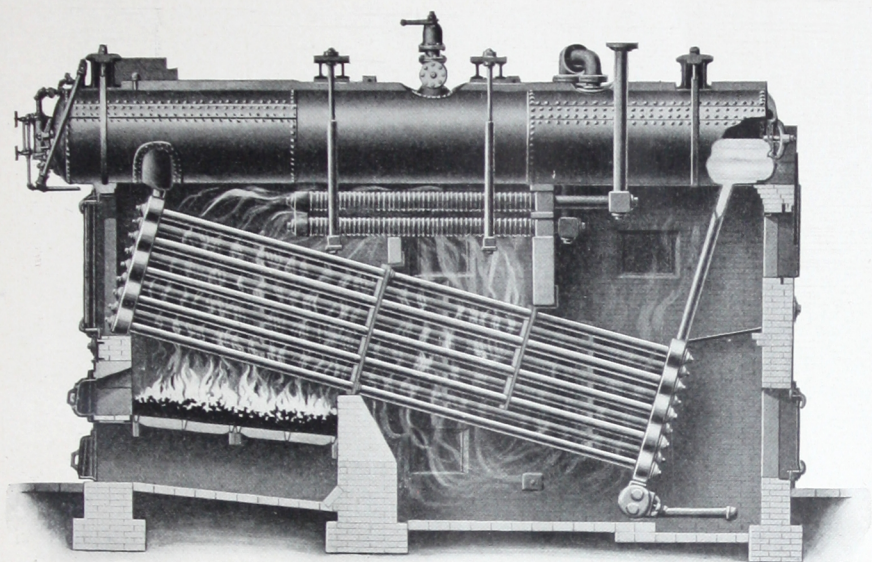
Boilers not designed for high pressure, or old boilers which have been weakened by use, may be fitted with superheaters, and thus rendered serviceable at a moderate cost and without the waste of time and inconvenience incident to renewal.



Foster Superheater combined with Horizontal Return Tubular Boiler equipped with Kent Wing Wall Furnace.

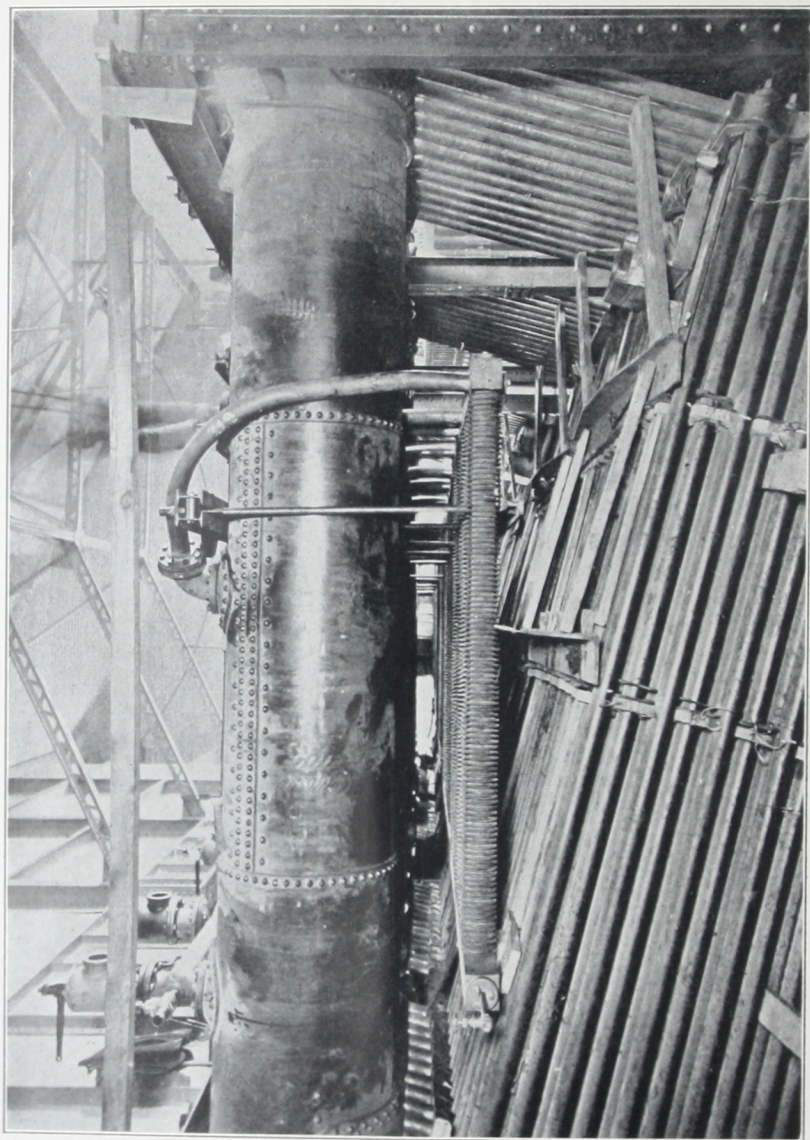


Foster Superheater attached to a horizontal return tubular boiler.

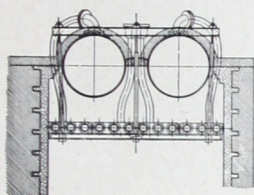


*Foster Superheater combined with Babcock & Wilcox Horizontal Water Tube Boiler.
The style of elements with return bends as illustrated on pages 4 and 5 are also used in this
type of boiler.*

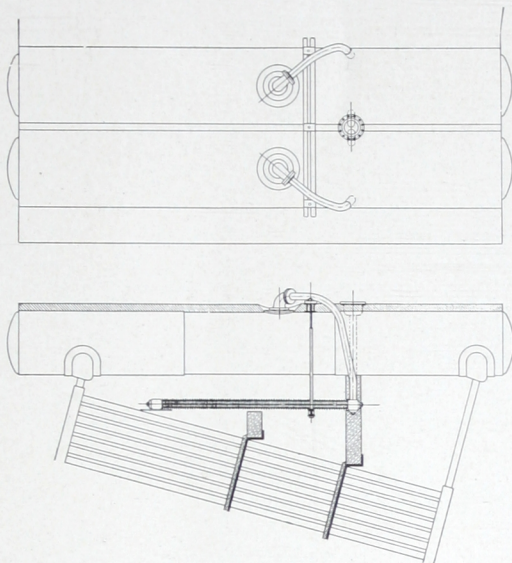
This arrangement is one which has been very generally adopted and in connection with this type of boiler has given much satisfaction. As the weight of the superheater is entirely supported from above, there is a complete lack of rigidity which would have a tendency to resist expansion. Existing boiler plants are readily equipped with this system without putting more than one boiler out of commission at a time.



Foster Superheaters combined with Babcock & Wilcox Boilers at the Naval Gun Factory, Washington, D. C.



Transverse cross section.



Plan and longitudinal cross section.

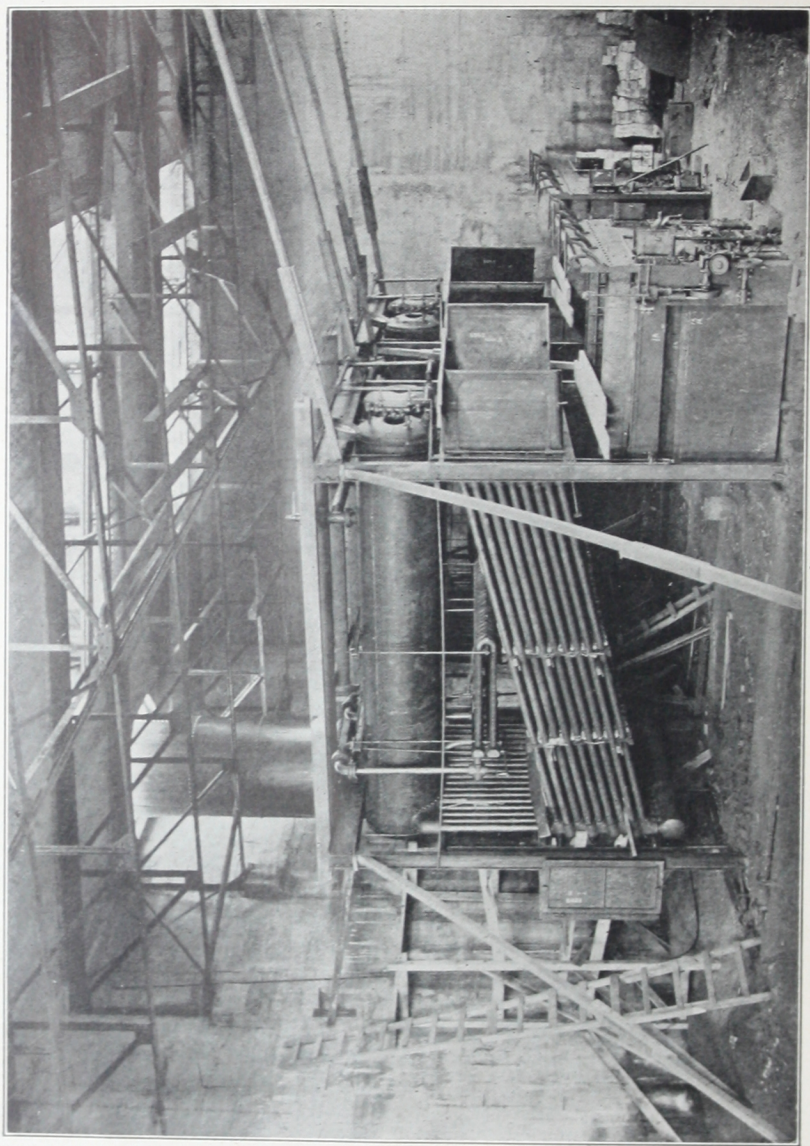
Foster Superheater combined with B. & W. Boiler at the U. S. Naval Gun Factory, Washington, D. C.

This arrangement of Foster Superheaters, combined with Babcock and Wilcox boilers, was adopted by the United States Navy Department for the power house at the gun factory at Washington, D. C.

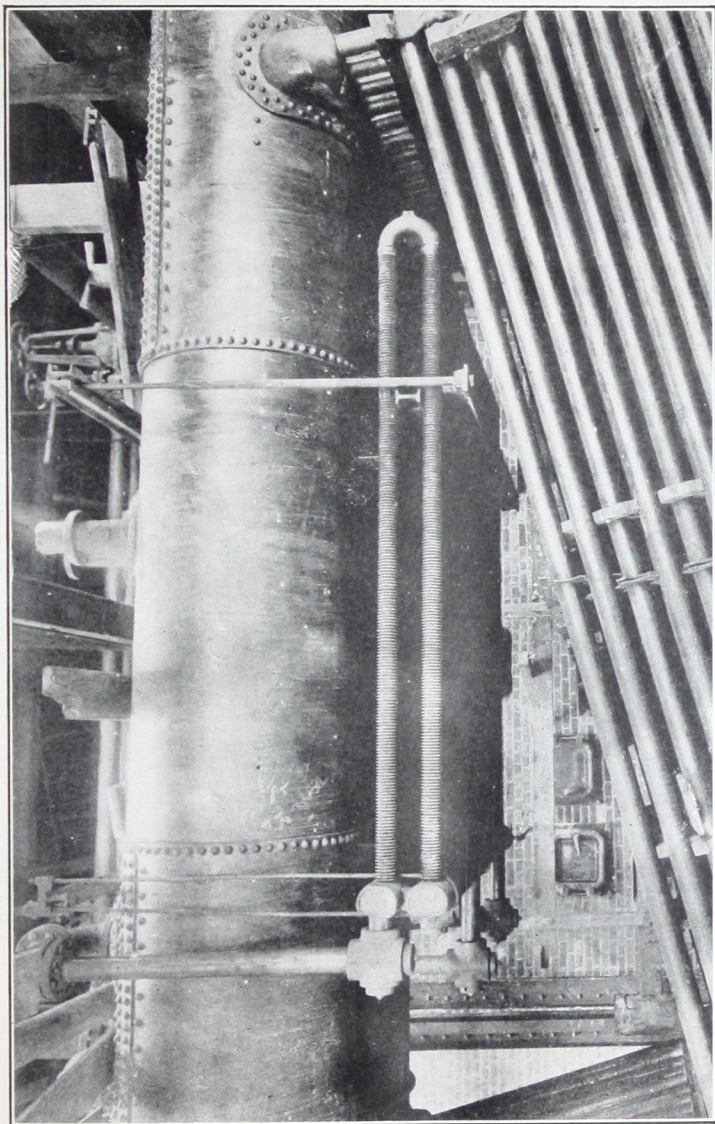
The units are of 300 horse-power capacity each. The first contract for five units was followed at intervals of about six months by a second, third and fourth contract, each for five more units.

The steam pressure is 200 pounds per square inch and the superheat 120° F.

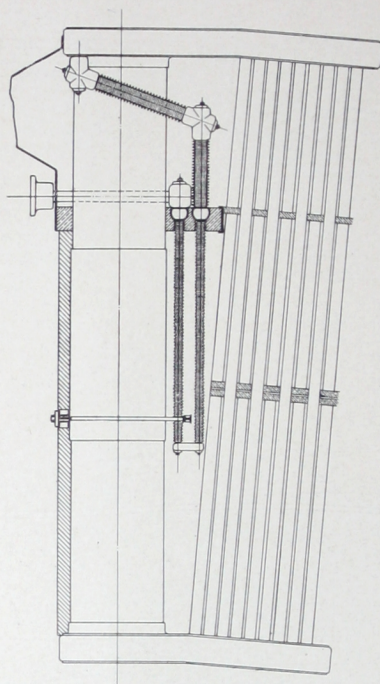
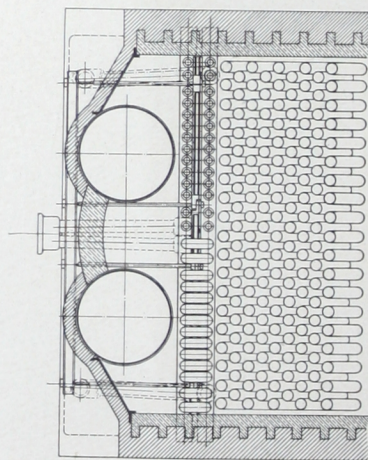
The single row of elements makes a very simple and compact construction. The front headers span the boiler from wall to wall, while the rear headers are sectional and divide the elements into inlet and outlet groups, and likewise give flexibility for expansion and contraction under differences in temperature.



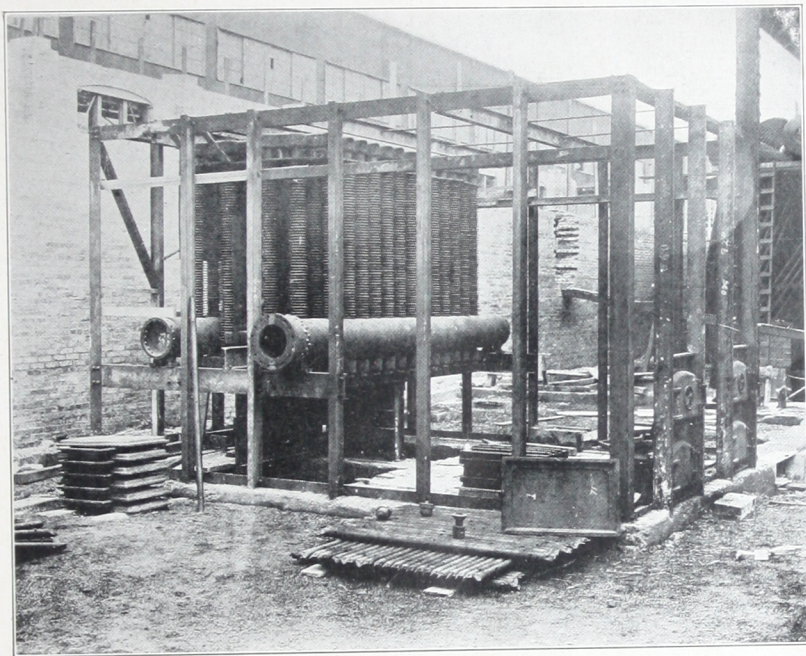
Foster Superheater with Aultman-Taylor Boilers at the Tennessee Copper Co., Copper Hill, Tenn.



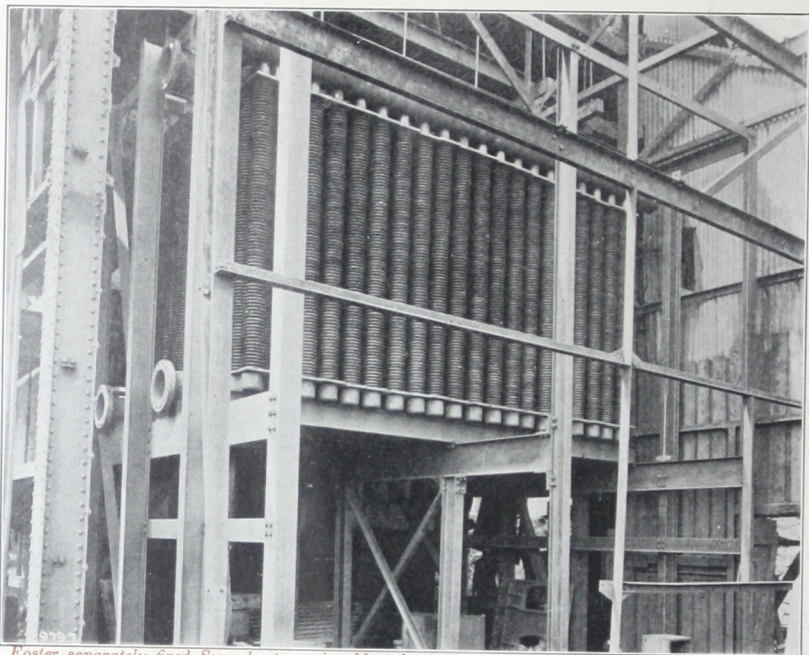
*Foster Superheaters in Babcock & Wilcox boilers at the power plant of the N. Y., N. H. & H. R. R.
Co. at Readville, Mass.*



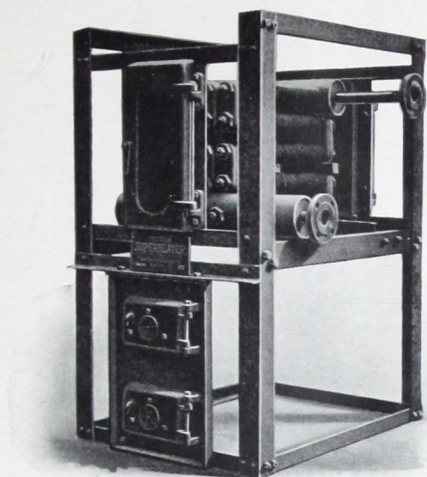
*Foster Superheater combined with Edge Moor Water Tube Boiler.
One of the largest plants of this type which we have equipped is the Ashley Street plant of the Union Electric Light
and Power Co. of St. Louis, containing forty 500 H. P. Units.*



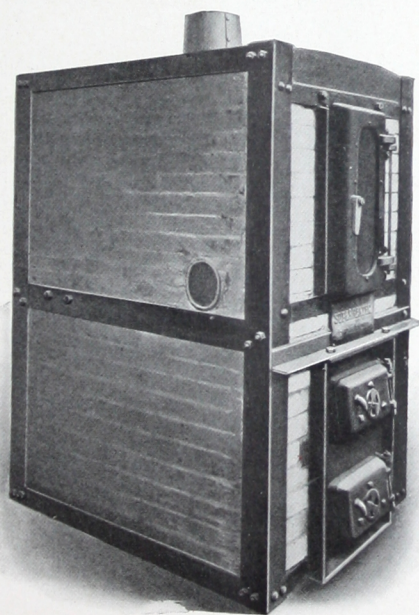
Foster separately fired Superheater during course of erection at the plant of the American Car & Foundry Co., St. Louis, Mo. The capacity of this Superheater is 96000 lbs. of steam per hour superheated 100° Fahrenheit above the temperature of steam at 160 lbs. pressure.



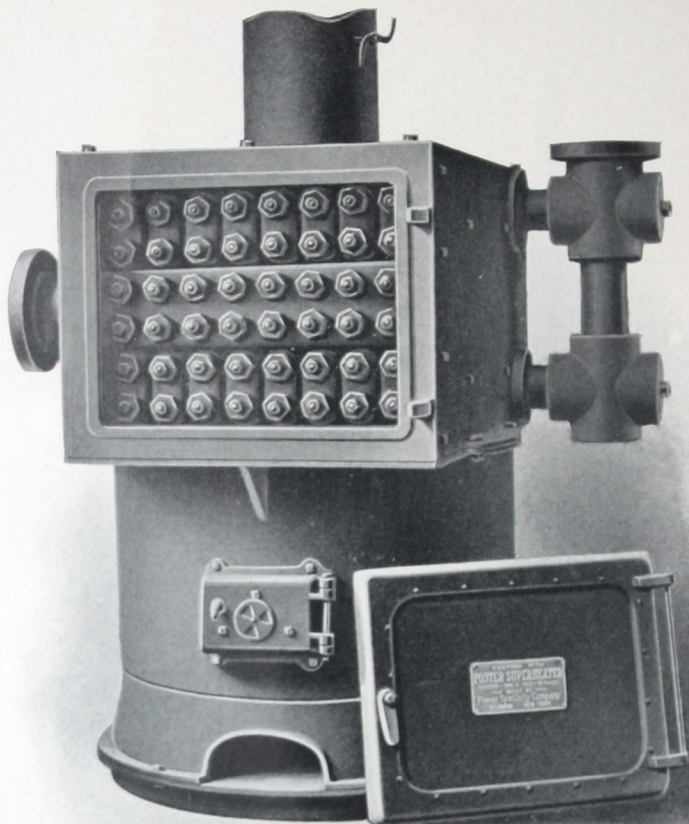
*Foster separately fired Superheater using blast furnace gas at the Illinois Steel Co., Joliet, Ill.
Blast furnace gas and coal used for fuel. Capacity 1500 H. P.
700° Fahrenheit final temperature.*



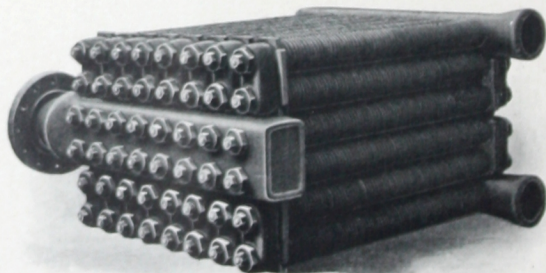
Small separately fired Foster Superheater ready for brickwork.



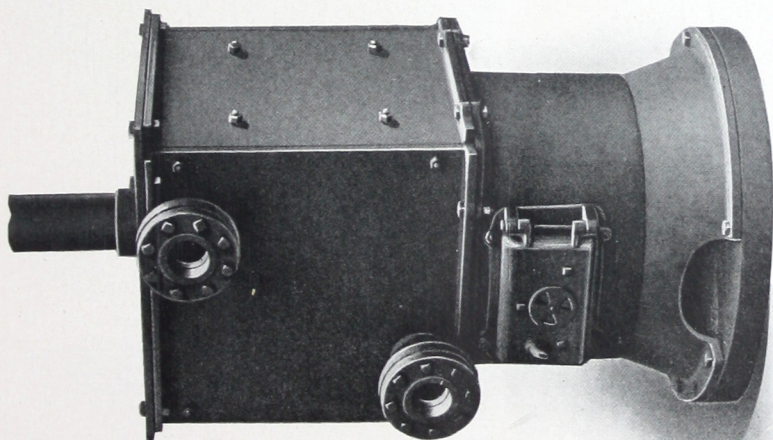
Small separately fired Foster Superheater complete.



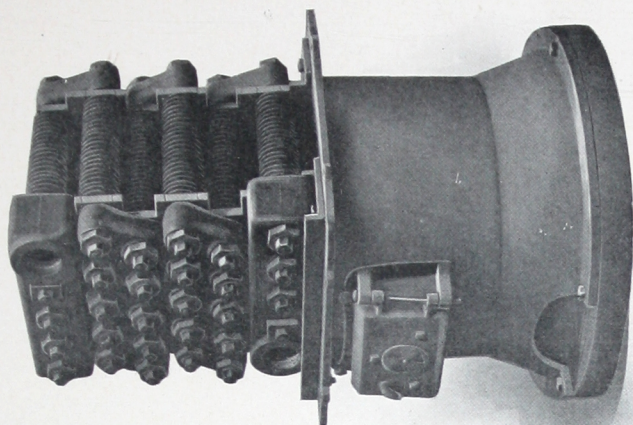
Small separately fired portable Foster Superheater, no brick setting required; may be fired by coal oil or gas.



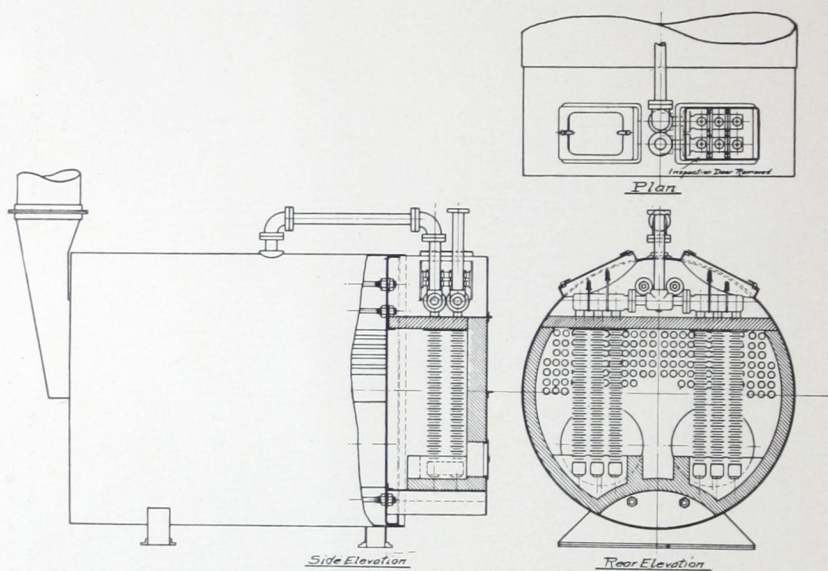
Heating surface complete for small separately fired Foster Superheater.



Small portable Foster Superheater for experimental purposes or field work, such as heating air for drilling, hoisting or general contractors' work.



Small portable Foster Superheater with part of casing removed.



Foster Superheater combined with internally fired Continental Boiler.

INFORMATION REQUIRED.

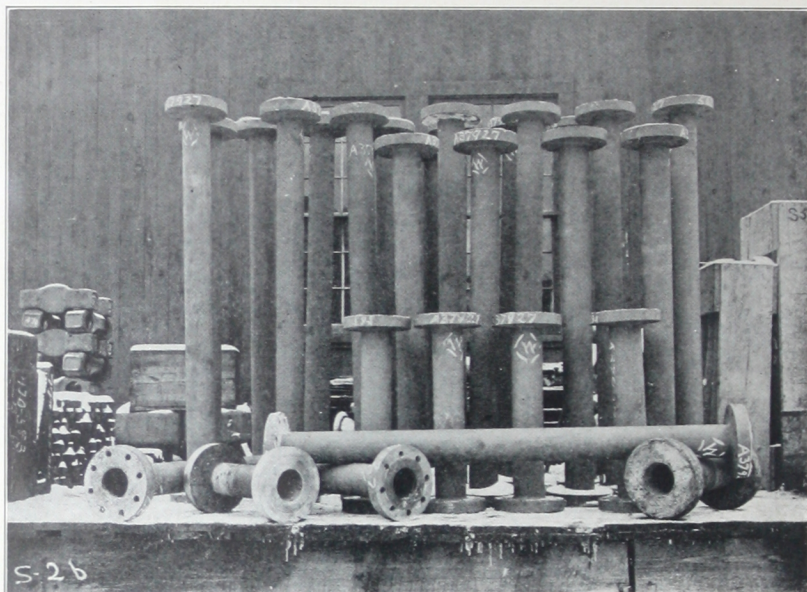
It is of the greatest advantage in asking for prices or recommendations as to the use of superheat to furnish us with full information. It is only by carefully considering all of the circumstances of operation that we are enabled to form an intelligent recommendation. Such details should be given as:

The amount of steam to be superheated,
Pressure at which the steam is generated,
Style, size, and if possible, the heating surface of the boiler,
Kind and amount of coal used,
Kind of grates used,
Drawing or sketch, if possible, of the boiler and steam piping,
Length and size of pipe between the boiler and each engine,
Kind of covering and thickness,
Number, size and style of the engines, also length of time in operation.

A blank form will be furnished on application giving the points which it is necessary to cover.



Section Foster Patent Superheater element, showing inner tube.

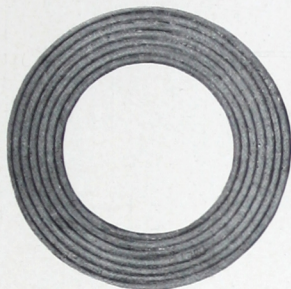


Welded steel flange for steam pipe joint, made by Power Specialty Co.

WELDED STEEL FLANGES.

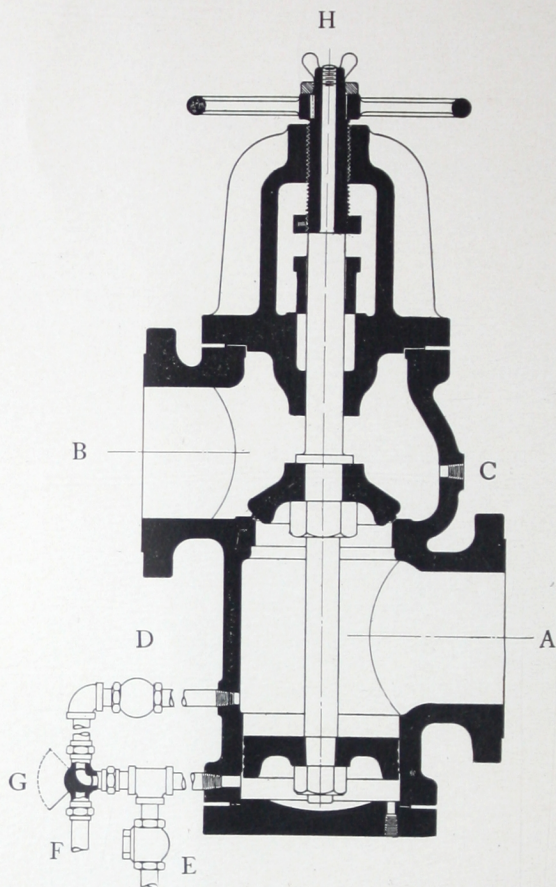
We are well equipped for making welded steel flanges and pipe bends for steam pipes, and other work requiring high grade material.

SUPERHEATED STEAM BRONZE GASKETS.

*Corrugated bronze gasket.*

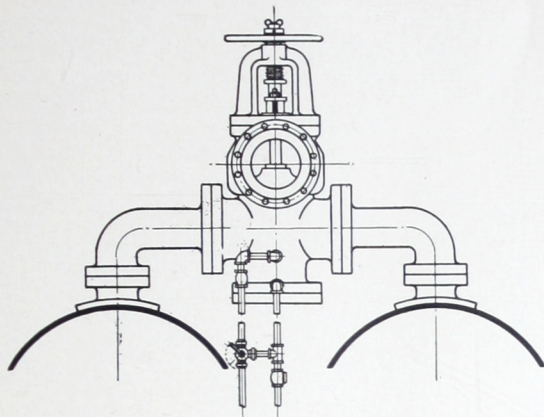
These gaskets have been found to give excellent satisfaction in flanged joints of pipes carrying superheated steam. They are corrugated evenly with sharp ridges. The metal is well suited to high temperatures and has elastic properties tending to maintain tight joints.

Diameter of hole,	3"	4"	5"	6"	7"	8"	9"	10"	12"	14"
Overall Diameter of Standard Sizes kept in Stock,	5 $\frac{1}{2}$ "	7"	8 $\frac{3}{8}$ "	9 $\frac{1}{4}$ "	10 $\frac{1}{8}$ "	12"	13"	14 $\frac{1}{4}$ "	16 $\frac{1}{4}$ "	19"
Price per dozen gaskets, . . .	\$3.00	\$4.20	\$5.40	\$6.00	\$6.70	\$7.55	\$8.40	\$9.00	\$9.75	\$10.80



Willits Combination Valve, Patented Aug. 29, 1905.

A—Steam inlet; B—Steam outlet; C—Drain pipe connection; D—Check valve opening in with small hole through disc; E—Check valve opening out; F—Opening to atmosphere; G—Three-way cock for opening and closing valve; H—Thumb nut attached to valve by chain, to be screwed on stem when it is desired to operate valve by hand wheel.



WILLITS COMBINATION STEAM VALVE.

FOR SUPERHEATED OR SATURATED STEAM.

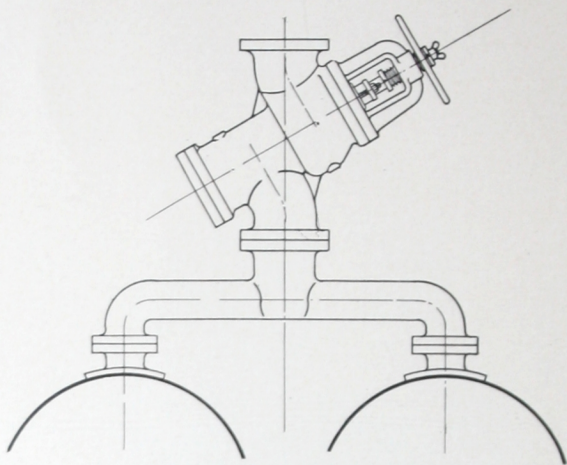
The increasing demand for an automatic stop valve in modern power plants led to the design of the Willits Valve, which accomplishes all the objects of both an automatic and hand-operated valve by an exceedingly simple and reliable form of construction.

FUNCTIONS.—The valve acts as a *non-return valve* to hold steam in pipes in the case of a rupture of a boiler flue.

As an *automatic emergency stop* to shut the steam off from the main in case of a rupture of the steam pipe.

As a *steam operated stop valve* it may be opened and closed at will, and as gradually as desired by turning the handle of the three-way cock, which cock may be located at the level of the boiler room floor or in the engine room, thus admitting of the manipulation of the valve from a distant point.

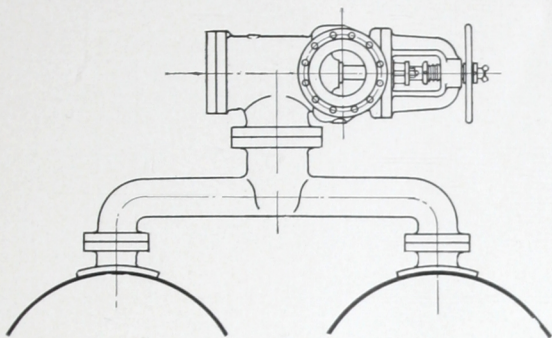
As a *hand-operated valve* it may be opened and closed by a hand wheel, as any ordinary valve.



DESCRIPTION.—In the Willits Valve the casing is extended to form a chamber and cylinder below the valve seat. The cylinder has a loosely fitted piston attached to the valve stem. There is a three-way cock which is piped to form a by-pass to the piston or to throw the lower portion of the cylinder open to atmosphere.

The valve stem is reduced in diameter at its upper end and runs into a sleeve which is attached to the hand wheel. A thumb screw is provided to attach the hand wheel to the valve stem for hand operation. Ordinarily the thumb screw is left off, but is kept hanging to the valve by a chain to prevent being lost.

OPERATION.—Assuming the valve attached to a boiler at the main steam outlet, the valve closed and the by-pass to the piston open. As steam is raised on the boiler the steam passes through the throttled by-pass underneath the piston. The piston has a larger area than the valve disc and the lower part of the piston has more area than the upper part, because of the valve stem. This excess of area raises the piston and valve disc as the steam pressure approaches that in the main line. The boiler is thus automatically in connection with the main when steam is up.

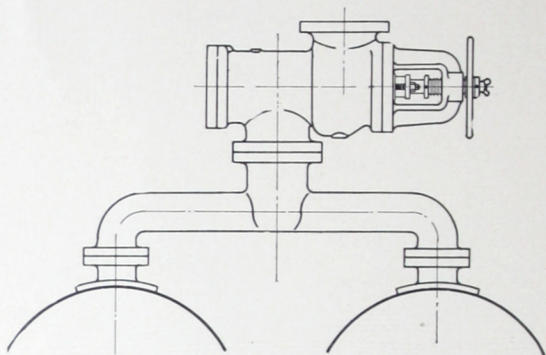


The valve will now close automatically if a flue bursts on the boiler or the pressure is suddenly lowered in any other way.

The valve will also close automatically if an explosion takes place in the steam pipe beyond the valve. This is provided for by connecting the small pipe "E" with the main steam header, a sudden lowering of the pressure in which will let the steam out from under the piston and the valve will descend.

As a steam operated valve the three-way cock "G" which may be located at any desired point, is thrown so as to form a by-pass to the main piston, in which case the valve will open by the steam pressure under the piston, because of its area being greater than that of the disc, and the valve may be closed by throwing the three-way cock so as to shut off the by-pass and open the connection from the underside of the piston to the atmosphere, in which case the steam pressure will force the piston down and close the valve.

By opening the valve the position of the three-way cock is reversed, and the outlet to atmosphere "F" cut off and the by-pass around the piston re-established. The steam then finds its way to the larger area on the underside of the piston and raises the piston and disc.



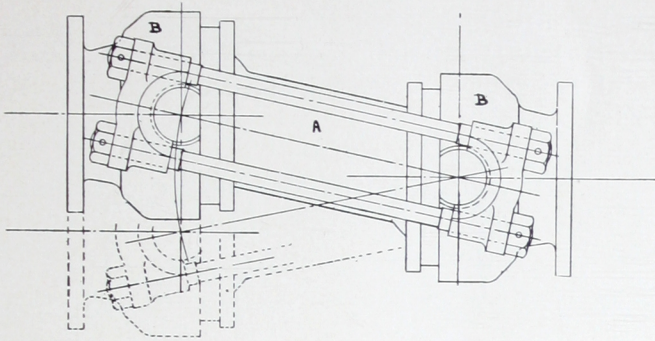
It will thus be seen that the valve may really be termed an over-balanced valve. To this feature the invention owes its great simplicity. The piston on the valve stem prevents chattering at all times. In practice the lower part of the cylinder fills with condensed steam, which forms a water-brake to prevent a too sudden opening or closing of the valve when operated automatically.

The check valve "D" has a small hole through the seat, which lets steam very gradually around the piston, also tending to open the valve gradually. When the thumb nut enters on the valve stem the valve may be opened and closed by hand as an ordinary globe valve.

It will thus be seen that the Willits Valve possesses all the requisites for an automatic emergency stop valve while it may be operated by hand or by steam from a distant point. The castings are proportioned for great strength and every effort is made to produce the very best article of this sort on the market.

The Willits Valve may be used in marine or stationary work in main and branch steam lines.

THE HARTER FLEXIBLE JOINT.



Flexible section of pipe made up with Harter patented ball joint at each end.

In the Harter Patent Joint, we have an ideal arrangement for taking up the expansion in steam pipes and one which has been tested in service and found satisfactory under the most severe conditions.

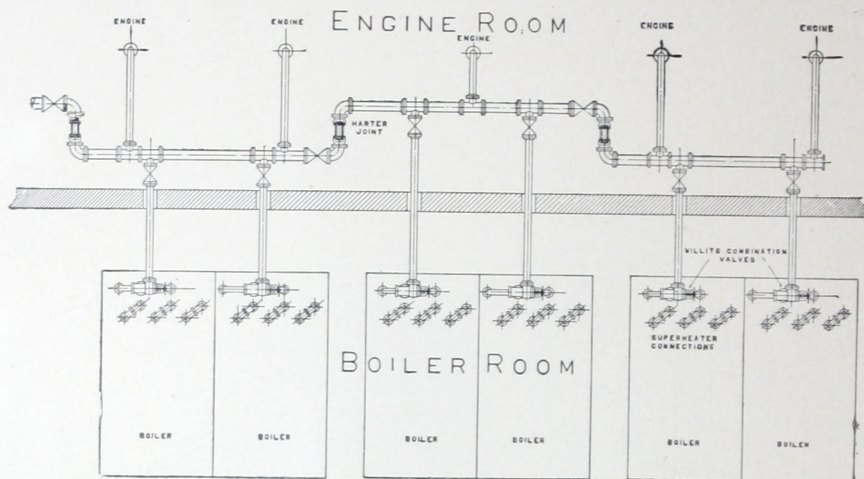
Standard joints are designed to take up an elongation equal to the diameter of the pipe. A greater range may be provided if desired.

Briefly described, this device consists of a perfectly flexible section, comprising a pair of interchangeable socket pieces provided with pipe flanges, and tied to each other by a pair of swinging links. A short pipe section, a portion of each end machined to a spherical surface, connects the two sockets. This forms a flexible section of piping with a universal joint at each end, which may be inserted in the line of the steam piping at any convenient point to take up expansion. The ball and socket joints at each end have metal to metal bearings and stuffing boxes are provided to effectually seal the contact points against any possible leak. The stuffing-boxes are under very slight motion of the metallic parts, hence are not objectionable.

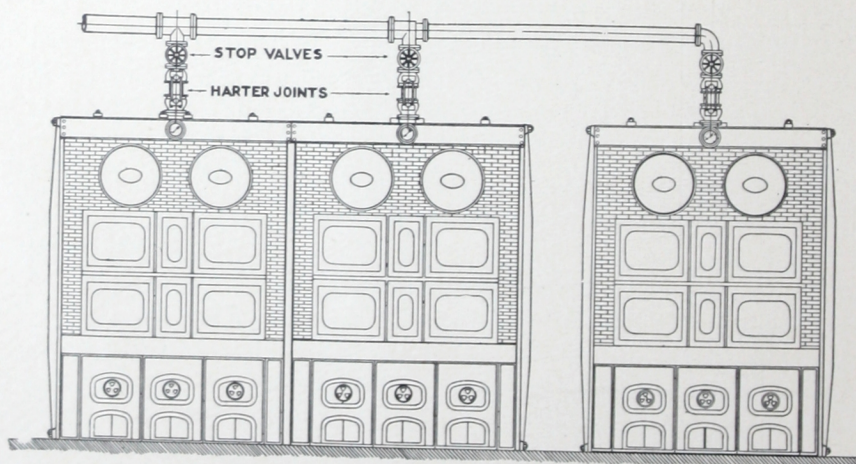
By using this expansion joint, steam pipes may be run in the most direct manner, saving not only the cost of extra pipe but of covering and of radiation of heat.

This joint is perfectly self-contained and avoids unnecessary length of pipe and excessive strains, which will be found in the ordinary long steel bends, and the rigidity, the unbalanced thrust, the frictional resistance and the long stuffing-box action of a telescopic form of expansion joint. It also possesses the advantage of less weight, less space occupied,

perfect alignment, freedom from bending strains, small chance of leakage and less cost than other forms of expansion joints. It may be used for temporary connections for testing engines or pumps or for locomotives where there is a separate movement of boilers and cylinders, or for hydraulic purposes, where a flexible connection is required, such as directing a large jet under heavy pressure.

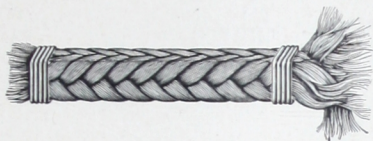


Plan of steam pipe arrangement showing Harter Joints to take up expansion.
Arrangement plan, showing use of Harter Joint to take up the entire expansion of steam piping.



Batteries of boilers connected by Harter flexible section, showing perfect allowance for expansion and contraction.

DUVAL METALLIC PACKING.



Piece of Duval metallic packing showing fibrous construction.

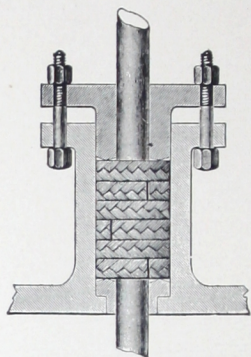
This packing will be found very satisfactory for engines using superheated steam or saturated steam. It is equally good for packing steel or cast iron plungers working in water or oil, and for accumulators. It has been used extensively on heavy pressures, from 500 to 1,000 pounds per square inch. For durability and frictionless action under such conditions, it is unequalled.

The packing consists of a mass of fine composition wire plaited into square form. Each individual wire is coated with anti-friction metal, which gives it the appearance of silver.

No special form of stuffing-box is required for Duval packing. It fits readily in any well proportioned box which was intended for soft packing and the gland is replaced.

The packing is flexible and readily bent around a rod or plunger.

Sections of proper length to form rings are cut off with hacksaw or wood chisel and after binding ends with light wire to prevent fraying are soaked in graphite and oil and laid in the stuffing box, breaking joints as shown in the cut. For steam boxes the strands are cut about 2% short to allow for expansion and one or two rings of soft packing are put in next to the gland to perfectly seal the packing while new. Asbestos makes a good seal for steam boxes and square flax, hemp or canvas for liquids.



Stuffing-box packed with Duval metallic packing.

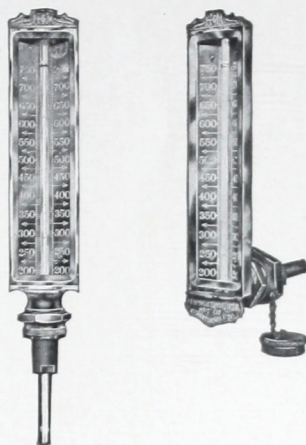
The soft packing may be replaced with Duval after a few days running.

Duval packing has lasted over seven years without renewal.

Sizes,	$\frac{1}{4}$ in.	$\frac{5}{16}$ in.	$\frac{3}{8}$ in.	$\frac{7}{16}$ in.	$\frac{1}{2}$ in.	$\frac{9}{16}$ in.	$\frac{5}{8}$ in.	$\frac{11}{16}$ in.
Approximate weight per foot,	.14 lbs.	.25 lbs.	.34 lbs.	.50 lbs.	.55 lbs.	.70 lbs.	.90 lbs.	1.0 lbs.

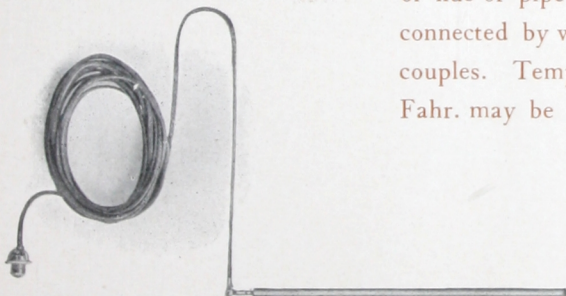
Sizes,	$\frac{3}{4}$ in.	$1\frac{1}{8}$ in.	$\frac{7}{8}$ in.	$1\frac{5}{16}$ in.	1 in.	$1\frac{1}{8}$ in.	$1\frac{1}{4}$ in.
Approximate weight per ft.	1.70 lbs.	1.75 lbs.	1.90 lbs.	2.40 lbs.	2.60 lbs.	3.18 lbs.	3.80 lbs.

Thermometers with straight or angle stem for attachment to superheated steam pipes.



Portable instrument for reading temperature.

Electrical Pyrometer for measuring high temperature furnaces and flues. The couple, which may be ordered of any desired length, is inserted through a hole in the wall of flue or pipe. The instrument is connected by wire to one or several couples. Temperatures up to 3000° Fahr. may be accurately measured.



Couple and Connections to instrument.

FLOW OF SUPERHEATED STEAM IN PIPES

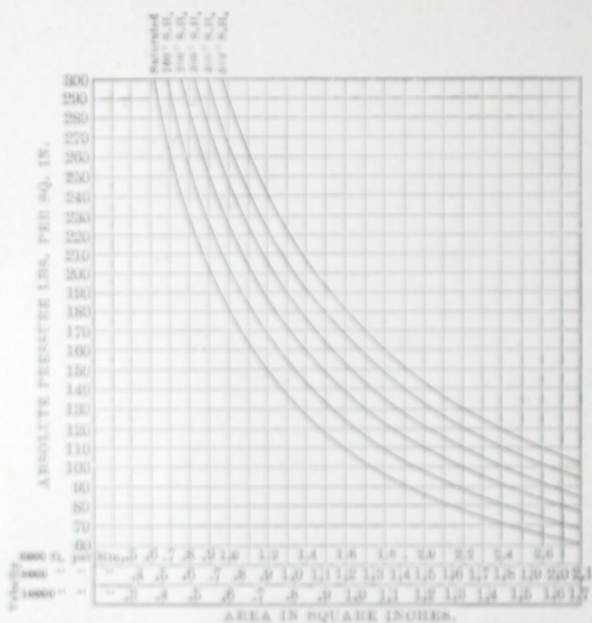


Diagram to show the required cross sectional area of a pipe passing 1000 lbs. of steam per hour at velocities of 6000, 8000 and 10000 ft. per minute and at different temperatures and pressures.

CARRYING CAPACITY EXTRA HEAVY STEAM PIPES

Nominal size of pipe inches.	Actual inside area in square inches.	Pounds of steam per Hour at velocity of			
		8,000 feet per minute for dry saturated steam. 8,500 feet per minute for steam superheated 50° F. 8,950 feet per minute for steam superheated 100° F. 9,450 feet per minute for steam superheated 150° F. 9,900 feet per minute for steam superheated 200° F. 10,450 feet per minute for steam superheated 250° F.			
		200 lbs. gauge.	150 lbs. gauge.	100 lbs. gauge.	50 lbs. gauge.
1	.71	1210	872	618	362
1 $\frac{1}{4}$	1.27	2000	1555	1105	646
1 $\frac{1}{2}$	1.75	2750	2140	1525	894
2	2.93	4610	3590	2550	1525
2 $\frac{1}{2}$	4.20	6610	5150	3660	2140
3	6.56	10300	8050	5720	3450
3 $\frac{1}{2}$	8.85	13900	10820	7720	4520
4	11.44	18000	14000	10000	5850
4 $\frac{1}{2}$	14.18	22300	17350	12320	7230
5	18.19	28610	22250	15800	9300
6	25.93	40800	31600	22600	13210
7	34.47	54600	42250	30000	17600
8	44.18	69500	54000	38400	22450
9	58.42	92000	71500	50800	29800
10	74.66	117300	91500	65000	38100
11	90.76	142800	111500	79200	46300
12	108.43	170500	133000	94750	55400
13	132.73	216000	162500	115500	67700
14	153.94	242000	188200	133900	78600
16	176.71	277500	216200	153800	90500
18	226.98	357000	278000	197500	115700

TABLE OF PROPERTIES OF SATURATED STEAM.

Absolute pressure in lbs. per sq. in.	Gauge pressure barometer at 29.922 in.	Temperature, Fahrenheit	Heat units per pound, from zero, Fahrenheit		Cubic feet per pound	Weight per cubic foot
			Total heat	Latent heat		
65	50.3	297.8	1204.8	904.5	6.53	.1533
70	55.3	302.7	1206.3	900.9	6.09	.1643
75	60.3	307.4	1207.7	897.5	5.71	.1753
80	65.3	311.8	1209.0	894.3	5.37	.1862
85	70.3	316.0	1210.3	891.3	5.07	.1971
90	75.3	320.0	1211.6	888.4	4.81	.2080
95	80.3	323.9	1212.7	885.6	4.57	.2188
100	85.3	327.6	1213.8	882.9	4.36	.2296
105	90.3	331.1	1214.9	880.3	4.16	.2403
110	95.3	334.5	1216.0	877.9	3.98	.2510
115	100.3	337.8	1217.0	875.5	3.82	.2617
120	105.3	341.0	1217.9	873.2	3.67	.2724
125	110.3	344.1	1218.9	870.9	3.53	.2830
130	115.3	347.1	1219.8	868.7	3.41	.2936
135	120.3	350.0	1220.7	866.6	3.29	.3042
140	125.3	352.8	1221.5	864.6	3.18	.3147
145	130.3	355.5	1222.4	862.6	3.07	.3253
150	135.3	358.2	1223.2	860.6	2.98	.3358
155	140.3	360.7	1224.0	858.7	2.89	.3463
160	145.3	363.3	1224.7	856.9	2.80	.3567
165	150.3	365.7	1225.5	855.1	2.72	.3671
170	155.3	368.2	1226.2	853.3	2.65	.3775
175	160.3	370.5	1226.9	851.6	2.58	.3879
180	165.3	372.8	1227.7	850.0	2.51	.3983
185	170.3	375.1	1228.3	848.2	2.45	.4087
190	175.3	377.3	1229.0	846.6	2.39	.4191
195	180.3	379.5	1229.7	845.0	2.33	.4296
200	185.3	381.6	1230.3	843.4	2.27	.4400
205	190.3	383.7	1231.0	841.9	2.22	.4503
210	195.3	385.7	1231.6	840.4	2.17	.4605
220	205.3	389.7	1232.8	838.6	2.06	.4852
230	215.3	393.6	1234.0	835.8	1.98	.5061
240	225.3	397.3	1235.1	833.1	1.90	.5270
250	235.3	400.9	1236.2	830.5	1.83	.5478
260	245.3	404.4	1237.3	827.9	1.76	.5686
270	255.3	407.8	1238.3	825.4	1.70	.5894
280	265.3	411.0	1239.3	823.0	1.64	.6101
290	275.3	414.2	1240.3	820.6	1.59	.6308
300	285.3	417.4	1241.2	818.3	1.54	.6515

ADVANTAGES OF SUPERHEATING

Higher temperatures	More heat units
Greater volume	Absence of moisture
Decreased friction	Saving in steam
Saving in coal	Perfect gas properties
Better vacuum	Less steam to condense
Smaller piping	Unloads boilers
Greater efficiency in engines and turbines	
Increases duty of pumping engines	
Increases capacity of steam turbines	
No drips from joints or stuffing-boxes	

VARIOUS USES

Steam engines
Steam turbines
Evaporating tanks
Drying rooms
Heating systems
Wood preserving
Chemical works
Glycerine making
Industrial plants
Cooking
Asphalt reduction
Long steam lines



Trinity Building 111 Broadway, New York City, in which is located the main office of the Power Specialty Company.



